

Flattening with the New Common of Space



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A little more than 100 years ago, the naval strategist and writer, Alfred T. Mahan, described the seas as a “wide common ... a great highway ... over which men may pass in all directions.”¹ In Mahan’s time, the seas were the international domain of trade and intercontinental commerce. Nations and states aspired to access and command the seas so they could establish, protect and expand their economic or political interests. To the degree this was possible, participation in this common enhanced or diminished a nation’s position and power. Mahan also emphasized that control of this common enabled control of the battlespace.

Looking more recently, Thomas Friedman takes the position the world has become “flat” in the sense that global changes in the past few years have contributed significantly to opening of international markets. Friedman also notes the rise of the Internet and easy access to vast amounts of information have “produced a global, Web-enabled playing field that allows for multiple forms of collaboration without regard to geography or distance.”² This change is viewed as a paradigm shift that will create many opportunities for those who can and will take advantage of them.

The ubiquitous nature of Space and cyber-space and their fundamental importance to national power support the view these dimensions should be considered as “commons.” Our Nation has acknowledged ready access to the Internet is inextricably linked to

our broader economic, social and military interests. Space-based capabilities remove the barriers — or “flatten” — restrained access to the vast information stores available via the Internet.

Space enables capabilities that simply cannot be matched by terrestrially based assets. Intercontinental communications have been transformed to satellite-based means. Similarly, the hundreds of channels now available by satellite dish and satellite radio are eclipsing broadcast television and over-the-air radio. Equipment costs and subscriptions for these services have been “flattened,” and are now within the financial means of most middle income families of western societies. Navigation, including in personal vehicles, is enhanced by near-real time Space-based global positioning system (GPS) satellites. Space-based assets facilitate billions of banking transactions each day.

Weather satellites, which generate about 90 percent of the forecasting data used in the U.S., have also significantly enhanced the accuracy and timeliness of predictions. The early analysis of the death tolls from the extraordinarily destructive 2005 hurricane season in the U.S. concluded thousands more people could have died if weather satellites would not have been available to provide advanced warning of impending danger. A member of Congress noted, “Without Space-based capabilities, it might have taken weeks to fully respond to the crisis. The Air Force’s Defense Meteorological Satellite Program satellites revealed to emergency

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The U.S. military currently enjoys a “command of the commons” that translates into an unparalleled capacity to leverage the capabilities of the oceans, air, Space and cyber-space, and the corresponding ability to mitigate their use by our adversaries.

management agencies those communities that lacked electrical power. Commercial remote sensing companies provided high-resolution satellite imagery to relief organizations, which helped determine the extent of the damage in specific areas.”³

Space tourism has already developed a niche industry. Notably, between April 2001 and October 2005, three Space tourists — two Americans and one South African — made flights to Space and the International Space Station.⁴ Although currently within the sole financial reach of the wealthy, this area is expected to expand — or “flatten” — substantially in the future.

Space: More than the Final Frontier

The U.S. military currently enjoys a “command of the commons” that translates into an unparalleled capacity to leverage the capabilities of the oceans, air, Space and cyber-space, and the corresponding ability to mitigate their use by our adversaries. If the adage is true that the present is the product of the past, then Mahan’s concept of dimensions that have strategic value to national interests remains valid yet today. Mahan’s view of the seas as a “wide common” has great similarity to the current view of the importance of Space.

Nations and groups with aspirations of increased influence try to erode our ability to operate effectively in the commons and attempt to control the commons for their own use. A nation no longer has to be a Space power to employ it. Barriers to entry into Space, which were so high just a few years ago, have now eroded or “flattened.” Space-based capabilities are increasingly available to nations that in

fact do not possess Space-based technologies. Many Space-based capabilities are now accessible to virtually anyone with a computer, credit card and broadband Internet access. New opportunities for others now serve as challenges to our own military forces.

The rapid convergence of information, communication and computer technologies has facilitated a variety of new military capabilities. Information gathered from and transmitted through Space is an integral component of American military operations. Space-based capabilities let our military forces communicate instantaneously, get near real-time information that can be transmitted rapidly from satellite to attack platform, and navigate to engagement areas. These capabilities also provide the flexibility to deliver precise effects without putting people and equipment in harm’s way. As noted by Secretary of Defense Donald Rumsfeld, the use of Space “enables us to project power anywhere in the world from secure bases of operation.”⁵ Early warning of missile attacks and the precision of kinetic and non-kinetic attacks from the land, air and sea are also enhanced significantly with Space-based capabilities.

Just as technological and industrial dominance have played prominent roles in U.S. military victories during the past 60 years, Space-based capabilities are instrumental to our Nation’s ongoing support of military forces involved in the Global War on Terrorism (GWOT). The changing nature of the threat has made the use of Space essential to our success. Today, Soldiers fighting in the GWOT confront adversaries who are adaptive, decentralized and elusive. President Bush recently described this enemy as one “determined and brutal, unconstrained by conscience or the rules of war.”⁶

(See Common of Space, page 44)

Insurgent forces attempt to avoid the overwhelming conventional superiority of U.S. forces by using tactics designed to exploit perceived vulnerabilities in our capabilities. Even those who are not catching up with us technologically can do us harm on the cheap, frequently employing relatively low-technology weapons like improvised explosive devices. However, our Soldiers are demonstrating extraordinary resourcefulness against this cunning enemy, employing capabilities — including those that are Space-based — in new ways to achieve operational success while protecting the lives of coalition forces and noncombatants.

Flattening with Space-Based Capabilities

Identifying warfighters' most relevant operational capabilities is an ongoing process, but one principle, in particular, is at the forefront: Situational Awareness. The goal of Situational Awareness is to enable Joint Warfighters to communicate with each other, share information about their location and that of the enemy, and simultaneously see the same, precise, real-time picture of the battlespace.

Situational Awareness is particularly vital given the challenges of conducting operations in built-up and mountainous areas, often referred to as "complex terrain." These areas may also include dense urban settings and the contested littorals where the majority of the world's population and economic activity are centered. Buildings, mountains and other permanent structures in complex terrain block line-of-sight communications and prevent Soldiers from seeing the enemy, as is often the case in Iraq and Afghanistan. Recent combat operations suggest the Army will

continue to operate in this type of terrain in the future.

Space-based capabilities are vital to warfighting in complex terrain by contributing to responsiveness and accuracy. Recognizing the potential of Space-based capabilities in complex terrain, LTG Thomas Metz, former Commanding General, Multi-National Corps — Iraq, recently observed, "Our precision [now] enables us to take the fight to the enemy in an urban fight."⁷

Situational Awareness includes capabilities in the areas of ballistic missile early warning, precision navigation and timing, and geospatial data. This area also encompasses Joint Blue Force Situational Awareness. The Fall 2004 and Spring 2005 issues of the Army Space Journal contain multiple articles referencing recent developments in JBFSA. I encourage your review of both issues.

The importance of ballistic missile early warning facilitated by Space-based assets was aptly demonstrated during Operation Iraqi Freedom (OIF) when Defense Support Program (DSP) satellites were used extensively to locate Iraqi missile launches, predict their target and provide warning. In an unclassified report, the commander, Combined Forces Air Component Command, estimated U.S. infrared satellites between March 19 and April 18, 2003 detected 26 Iraqi missile launches, 1,493 static events, and 186 high-explosive events.⁸ Ballistic missile early warning capabilities will become significantly enhanced in the coming years as the Space Tracking and Surveillance System and Space-Based Infrared System High satellites are launched and achieve operational capability. Clearly, the importance of Situational Awareness is extended into Space.

Space Situational Awareness (SSA) will have increased importance in the future since it is the first step to protecting our Space assets and the capabilities they provide. SSA is fundamental to protection, prevention and negation.

Our forces currently receive ballistic missile early warning support via the jointly manned Joint Tactical Ground Stations (JTAGS), forward deployed in multiple positions around the world. JTAGS provides a vital in-theater capability to receive, process and disseminate ballistic missile warning information from infrared data obtained by the DSP satellites. The new hardware and software upgrade of the JTAGS to a Multi-Mission Mobile Processor configuration will tremendously expand the current capabilities of JTAGS.

Our military's use of the GPS created a significant military advance in precision navigation and timing. GPS satellites send continuous navigation and timing signals that allow users around the world to find their position in latitude, longitude, altitude and time. The signals are so accurate that time can be figured to less than a millionth of a second, velocity to within a fraction of a mile per hour and location to within a few feet. The GPS network used by the U.S. currently has 24 primary satellites in six orbital planes with four satellites in each. Additional satellites are on orbit to serve as back-ups and provide additional coverage.

The GPS is vital to support guidance and navigation of "smart weapons." Hand-held GPS systems are also being field tested in Iraq that come pre-loaded with maps and databases and have the ability to display the Military Grid Reference System.⁹ As noted by LTG Daniel Leaf, former Vice Commander,

Our Nation's challenges are more complex, more subtle and harder to recognize — and they cannot be addressed by simply refocusing old capabilities on new adversaries.

Our job is to know what Space capabilities exist, understand those capabilities well enough to think of creative and innovative ways to use them and execute with enough strategic vision and determination to see and bring those capabilities to fruition.

Air Force Space Command, “A Soldier, or Marine or Airman on the ground in Iraq benefits from Space capabilities by being able to see the enemy, being able to communicate their plans and intentions and request support via satellite communications, [and] knowing precisely where they are, through [the] Global Positioning System.”¹⁰ The blue force tracking devices, Force XXI Battle Command Brigade and Below, Grenadier Beyond line-of-sight Reporting and Tracking, and Movement Tracking System, all depend on Space-based capabilities to convey data for development of a common operating picture.

The failed attempt during OIF to jam U.S. GPS signals created an important recognition of the importance of this system for our military capabilities. GEN Lance W. Lord, commander, U.S. Air Force Space Command, noted, “Saddam Hussein tried to jam our GPS satellites during OIF. We certainly knew it was

occurring, and we also attacked GPS jammers with GPS-aided direct attack munitions and killed them.”¹¹

Although originally designed as a guidance and navigational tool for the military, the GPS has also proven extraordinarily beneficial in the fields of transportation and surveying, commercial aviation and search and rescue operations. Police departments across the country already use the GPS to monitor the location of their officers and police cars. GPS satellites aid in tracking stolen cars and monitoring the location of persons fitted with ankle bracelets. Over a million new vehicles sold in 2005 were equipped with GPS navigation systems.¹² Also, during the wake of Hurricanes Katrina and Rita, “our GPS system helped our response units navigate areas devoid of landmarks or signs of previous existence.”¹³

The current fleet of GPS satellites is being upgraded to the GPS IIR-M series that features new military sig-

nals, allowing for better security and anti-jamming, as well as a second civil signal that will provide for increased accuracy. GPS-III satellites, expected to launch in 2013, will eventually replace the constellation of GPS satellites now on orbit. The new system will feature a “spot beam” capability to boost the power of the signal for users in a particular area. This spot beam and other features are expected to make the GPS-III system more jam resistant than satellites now on orbit.¹⁴

The benefits of the GPS are not lost on the international community. The Russian GLONASS system currently includes 17 satellites in orbit, with plans for a full constellation of 24 satellites.¹⁵ The Japanese also plan to launch a GPS constellation, the Quasi-Zenith Satellite System. On Dec. 28, 2005, the European Union (EU), representing a consortium of nations, launched the first of 30 planned GPS satellites that will

be part of the Galileo project. The Agreement on GPS-Galileo Cooperation, signed in June 2004, ensures that Galileo's signals will not harm the navigation capabilities of the U.S. and the North Atlantic Treaty Organization military forces and ensures an important compatibility between the American GPS and the EU counterpart. Clearly, the importance of GPS has expanded over the past several years, and is expected to increase — or flatten — further as accuracy is enhanced and systems proliferate.

Spectral imagery is used extensively to support military planning and combat operations in Afghanistan and Iraq by providing information on terrain and other areas of interest. As an example, the IKONOS satellite, a high-resolution commercial satellite that can provide 1-meter-resolution panchromatic (black and white) and 4-meter-resolution multi-spectral (color) images, collected more than 400,000 square kilometers of imagery over Afghanistan to permit updates of maps.¹⁶ Throughout the early phases of OIF, aerial surveillance aircraft, unmanned aerial vehicles and imagery from commercial satellites were “integrated, processed and disseminated to tactical users faster than in the past.”¹⁷

The quality and accessibility of spectral imagery will continue to increase as additional commercial satellites are launched. The WorldView commercial imaging satellite, capable of collecting images with 50-centimeter panchromatic and 2-meter multi-spectral resolution, is scheduled to launch in 2006.¹⁸ The military importance of commercial imagery has been enhanced, in particular, by the capability to share it with coalition members.

During the early phases of OIF, the SMDC/ARSTRAT Spectral Operations Resource Center (SORC) delivered hundreds of imagery-based spectral products, including those used for identification of terrain hazards, drop zone analysis, and route reconnaissance. Imagery was also invaluable to the detection of soil disturbances that led to the discovery of mass graves of men, women and children killed during the regime of Saddam Hussein. The SORC articles in the Spring 2002, OIF Special Edition (Volume 2, Number 3), and Winter/Spring 2004 (Volume 3, Number 1) editions of the Army Space Journal provide excellent recaps of their contributions.

Expanding on the already extraordinary capabilities of spectral imagery is the broader discipline of Measurement and Signatures Intelligence (MASINT) and Advanced Geospatial Intelligence (AGI), which are focused on the collection, processing and analysis of distinctive characteristics of fixed or dynamic sources. Physical evidence in some form is left behind by virtually all activities and events. MASINT and AGI analysts measure physical characteristics of targets or events and provide information on their location, composition and performance. Almost all sensors can provide information that MASINT and AGI analysts can exploit, including radar, optical, infrared, acoustic, nuclear, radiation detection and seismic systems, as well as gas, liquid and solid materials sampling systems.¹⁹ As demonstrated during the Joint Task Force-Katrina relief efforts, hyperspectral sensors can provide data where identification of materials can only be made through technical analysis, as with identifying the types and extent

of pollutants in massive flooded areas.

Space-based systems, with their vast fields of view and capability to conduct remote sensing, are well suited to perform this broader analysis mission and are a valuable source in which to provide support to warfighters. Formation of the new U.S. Strategic Command Measurement and Signatures Intelligence (USSTRATCOM/MASINT) AGI Node in August 2005 builds on the capabilities of the SORC by providing expanded capabilities and tailored MASINT and AGI products to warfighters.

Netcentricity: The Vital Enabler

Enabling the synchronized application of Situational Awareness capabilities will require the development of a seamless, secure grid that connects the systems and delivers the capabilities to joint warfighters. The Global Information Grid (GIG), envisioned as a system-of-systems that encompasses all levels of battle command, will link commanders and Soldiers on-demand with the necessary voice, data and video communication, command and intelligence capabilities. The GIG will be used to support informational superiority, locate and identify the enemy, and provide the capability to deliver kinetic and non-kinetic effects before the enemy can engage.

The GIG, which is being formed based on networks and communications systems, will provide the means for forces at all levels to achieve situational understanding and establish, maintain and distribute a relevant common operating picture for joint warfighters. A meaningful step in the construction of this integrated network occurred on Dec. 20, 2005

when the GIG Bandwidth Expansion (BE) effort achieved full operational capability. The GIG BE is a massive project to “link 92 defense and intelligence sites across the globe to a new high-speed Internet Protocol network.”²⁰ Programs envisioned under the broader GIG architecture include the Transformational Communications Satellite, the Joint Tactical Radio System and the Network Centric Enterprise Services.²¹

A Challenging Time for Space

GEN Peter J. Schoomaker, Chief of Staff, Army, recently noted, “The challenge for the future is to develop capabilities that provide overwhelming dominance for the Soldier, especially those who engage in the brutal, often deadly, close tactical fight, or those who engage in complex stability and humanitarian operations that we’re surely to see more of in the future. We must put American technology, intellect and resources to work to ensure success and the safety of those who perform these difficult tasks.”²² With this succinct guidance, the pathway for the near future is identified for all Soldiers, but notably Space professionals responsible for providing cutting-edge capabilities for timely support of operational requirements.

Our Nation’s challenges are more complex, more subtle and harder to recognize — and they cannot be addressed by simply refocusing old capabilities on new adversaries. Our job is to know what Space capabilities exist, understand those capabilities well enough to think of creative and innovative ways to use them and execute with enough strategic vision and determination to see and bring those capabilities to fruition. “Flattening with the New Common of Space” is a key step in that direction. Secure the High Ground!

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